Tone ringer IC for telephone set

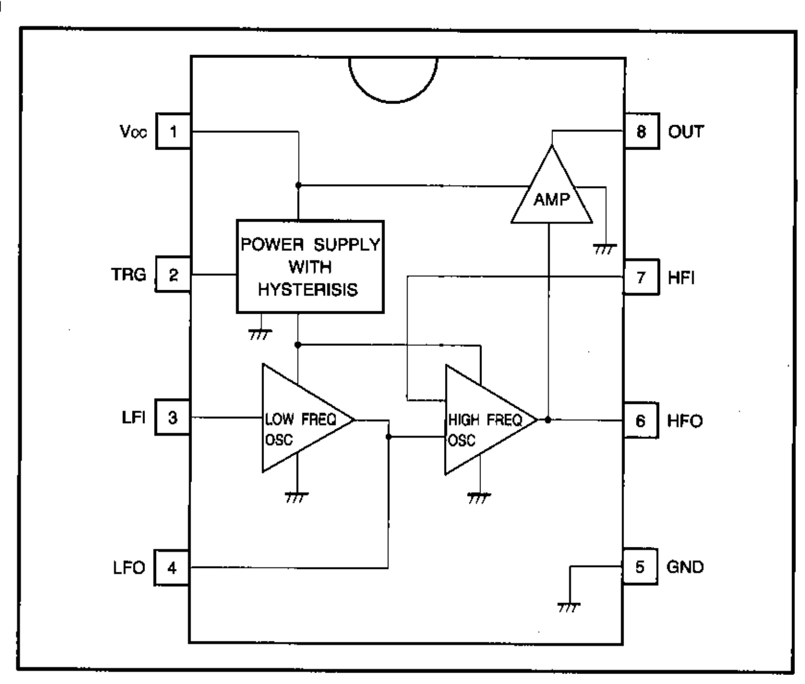
BA8204/BA8204F

The BA8204 and BA8204F are tone ringer ICs which produce a bell sound from a ringing signal. The frequency of the bell sound can be varied by changing the constants of the external resistance and capacitors.
The ringer threshold voltage can be changed at the TRG pin.
Also, the output load can be selected, as a piezoelectric buzzer, a transformer coupled speaker, or other similar devices.

●Applications
Telephones, multi-function telephones, telephone answering machines, facsimile machines, equipment involving telephones

●Features
1) Low current consumption.
2) Withstands up to 40V.
3) Ringer threshold voltage can be changed at the TRG pin.
4) Pin layout is compatible with the BA6564A and ML8204.

●Block diagram



●Absolute maximum ratings (Ta=25℃)

Parameter		Symbol	Limits	Unit
Power supply voltage		Vcc	40	V
Power dissipation	BA8204	Pd	500*1	mW
	BA8204F		450*2	
Operating temperature		Topr	−25~75	℃
Storage temperature		Tstg	−55~125	℃

*1 Reduced by 5mW for each increase in Ta of 1℃ over 25℃.
*2 Reduced by 4.5mW for each increase in Ta of 1℃ over 25℃.

●Recommended operating conditions (Ta=25℃)

Parameter	Symbol	Min.	Typ.	Max.	Unit
Operating voltage	Vopr	—	—	38	V

●Electrical characteristics (Unless otherwise noted, Ta=25℃, V_{CC}=24V)

Parameter	Symbol	Min.	Typ.	Max.	Unit	Conditions	Measurement Circuit
Initial supply voltage	V_{SI}	14	16	18	V	*1	Fig.5
Sustained operation supply voltage	V_{SUS}	8.2	9.8	11.2	V	*2	
Initial supply current	I_{SI}	1.3	2.2	2.9	mA	No load, $V_{CC}=V_{SI}$	
Sustained operation supply current	I_{SUS}	0.22	0.4	0.7	mA	No load, $V_{CC}=V_{SUS}$	
Oscillation frequency *3	f_L	9	10	11	Hz	R_1=773kΩ, C_1=0.1μF	Fig.6
Oscillation frequency *3	f_{H1}	446	512	563	Hz	R_2=595kΩ, C_2=0.0022μF	
Oscillation frequency *3	f_{H2}	565	640	703	Hz	R_2=595kΩ, C_2=0.0022μF	
"H" output voltage	V_{OH}	19.7	22.0	23.5	V	I_{OH}=10mA, 7pin=GND	Fig.5
"L" output voltage	V_{OL}	0.5	0.9	1.4	V	I_{OL}=10mA, 7pin=6V	
Ringer threshold voltage	V_{TR}	—	—	36.0	V_{rms}	R_{TRG}=330kΩ	Fig.4
Output leakage current	I_{LE}	—	—	1.0	μA		Fig.5

*1 The initial supply voltage is the power supply voltage required for the tone ringer to begin oscillating.
*2 The sustained operation voltage is the power supply voltage required for the tone ringer to continue oscillating.
*3 The oscillation frequency is determined using the following equation.

$$f_L=\frac{1}{1.234\times R_1\times C_1}\ \text{(Hz)}$$

$$f_{H1}=\frac{1}{1.515\times R_2\times C_2}\ \text{(Hz)}$$

$$f_{H2}=1.24\times f_{H1}\ \text{(Hz)}$$

The recommended values for R_1 and R_2 are 330 kΩ or higher.
The ringer threshold voltage is the AC voltage required for the tone ringer to start ringing through the circuit shown in Fig. 4.
◎ Not designed for radiation resistance.

●Electrical characteristic curves

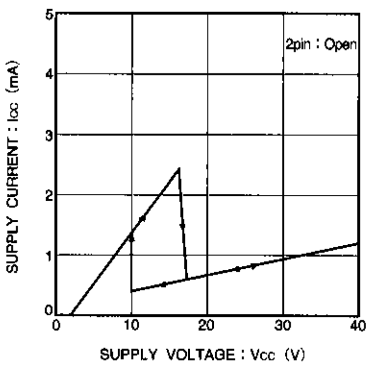


Fig. 1 Supply current vs. supply voltage characteristic

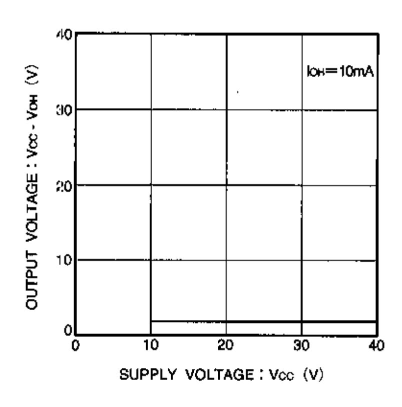


Fig. 2 Output voltage vs. supply voltage characteristic

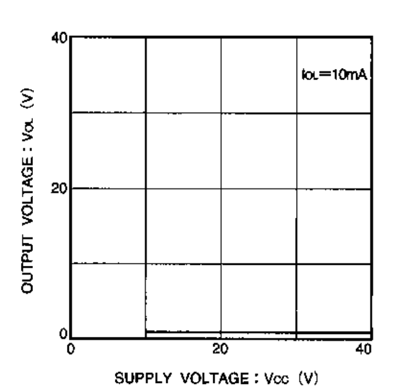


Fig. 3 Output voltage vs. supply voltage characteristic

●Measurement circuits

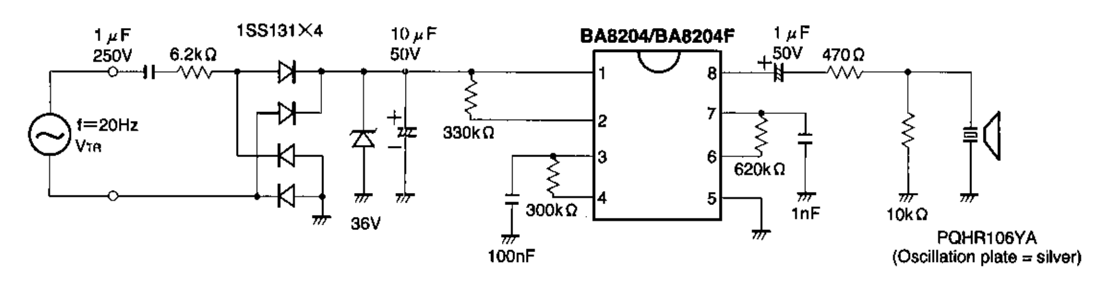
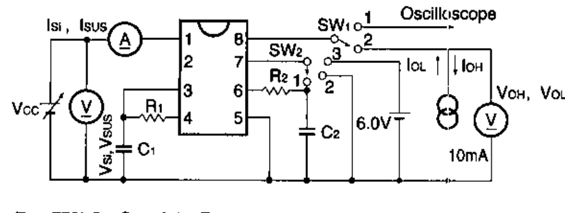


Fig. 4 Ringer threshold voltage measurement circuit



(Note) The table below shows the statuses for SW1 and SW2.

Item	SW1	SW2
V_{SI}, V_{SUS}	1	1
I_{SI}, I_{SUS}	1	1
V_{OH}	2	2
V_{OL}	2	3

Fig. 5 Measurement circuit (1)

(Note) The table below shows the statuses for SW_1 and SW_2.

Item	SW_1	SW_2
f_L	1	1
f_{H1}	3	2
f_{H2}	2	2

R_1=773kΩ, C_1=0.1μF
R_2=595kΩ, C_2=0.0022μF

Fig. 6 Measurement circuit (2)

●Circuit operation

Using the TRG pin

With the BA8204 and BA8204F, the TRG pin can be used to change the initial supply voltage (V_{SI}).

As shown in Figure 7, resistor R_{TRG} is connected from the TRG pin (Pin 2) to V_{CC}. The operation initiation voltage can be changed by changing the value of the resistor R_{TRG}.

Figure 8 shows the supply voltage (V_{CC}) - supply current (I_{CC}) characteristics when the value of the resistor R_{TRG} is changed.

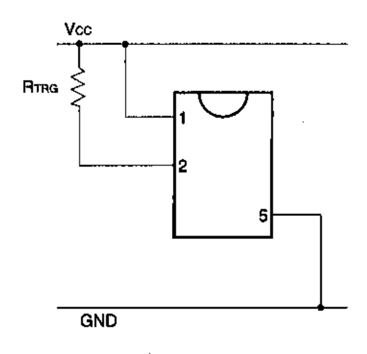


Fig. 7

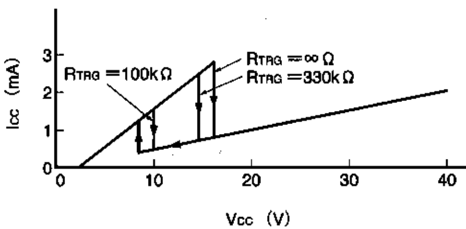


Fig. 8

●Pin description

Pin No.	Symbol	Name	Function
1	Vcc	Power supply pin	This is the power supply pin for the IC. It is connected to the (⊕) pin of the diode bridge.
2	TRG	Trigger input pin	This is normally open, but can be used to change the operation initiation voltage or to inhibit oscillation when a resistor is connected between the Vcc or GND pin, or when connected to a Zener diode.
3	LFI	Low-frequency time constant connector pin	This is connected to the time constant that determines the oscillation frequency on the warble side.
4	LFO		
5	GND	GND pin	This pin has the lowest potential on the IC. It is connected to the (⊖) pin of the diode bridge.
6	HFO	High-frequency time constant connector pin	This is connected to the time constant that determines the oscillation frequency on the tone side (the audible frequency side).
7	HFI		
8	OUT	Output pin	This is used to connect a piezoelectric buzzer, or to connect a dynamic speaker through a transistor.

●Operation notes

Ringing can be inhibited by connecting the TRG pin to GND. In this case, however, a zener diode should be used to suppress the V_{CC} pin voltage so it does not exceed 30V.

●Application example

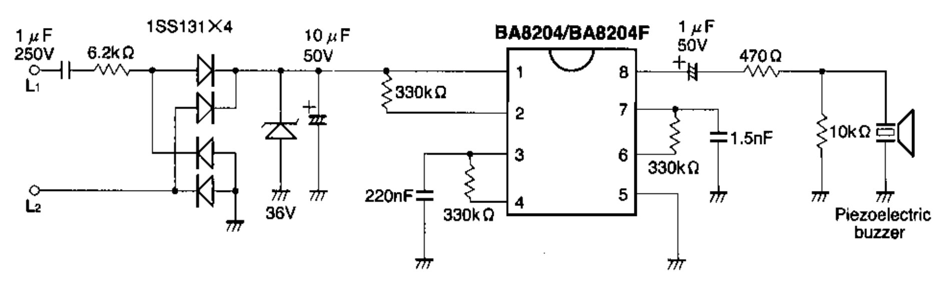


Fig. 9

●External dimensions (Units: mm)

